Personality and health: A problem of convergent-discriminant validity

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A problem of convergent-discriminant validity

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Bad personality makes you sick

And then kills

- If you score low on **Emotional stability** and **Conscientiousness**
  - Smoking, drinking, physical inactivity, poor diet
  - High BMI, elevated inflammation, metabolic syndrome, diabetes, cardiovascular disease, sexually transmitted disease etc.
  - Death
- Low **intelligence** is no better

Terracciano and Costa, 2004; Malouff et al., 2007; Rhodes and Smith, 2006; Mõttus et al., 2 x in press; Mõttus et al., in revision; Sutin et al. (2011), Sutin et al., 2010, 2010 and 2011, Goodwin and Friedman, 2006; Mõttus et al., in press; Kern and Friedman, 2008

But the effects are often really tiny

I mean, really tiny. Or they aren't there at all

Inflammatory markers:

- **Neuroticism** and **Conscientiousness** correlated to **IL-6**:
  - $r = 0.04$ and -0.07 ($p < 0.01$; N 5,000; Sutin et al., 2010)
  - Small studies have stronger effects (up to $r = .40$) but for different traits (Openness)
- Age-11 **intelligence** and age-45 inflammatory markers:
  - $r = -0.01$ to -0.06 ($p < 0.01$; N 9,400; Calvin et al., 2011)
- Traits account for **less than 0.5% of variance** in inflammation

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Maybe that's OK

Did we really expect to do better?

- There is probably about e^6 reasons why a particular bad health condition comes about
- Often probably idiosyncratic

But maybe stronger effects are sometimes just masked

Maybe bad is not bad for everyone

- Let's assume that traits influence health via health-related life-style choices and health-care
- Then maybe:
  - If your body is not inherently liable to a particular health issue, the personality-related behavioural choices may be less relevant **(e.g., genes x trait interactions)**
  - In an environment that facilitates health-care, you may have to invest less personal effort in keeping healthy compared to an adverse environment **(e.g., SES x trait interactions)**
  - If your body is young, the bad choices may have had less time to have an effect compared to when it is old **(age x trait interactions)**

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Could be built into our hypotheses

- Why not specify **when** these associations are more and when less likely to happen?
- Akin to the convergent-discriminant validity concept

Inherent vulnerability for diabetes

Is it especially bad if you have bad genes AND low IQ?

- Diabetes and related traits may be linked to low intelligence
- Can genetic risk for type 2 diabetes moderate the associations?
  - When the risk is higher, low IQ and the behaviours it entails are more consequential?
  - When the risk is lower, IQ may matter less

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Genetic risk X IQ interaction

Lothian Birth Cohort 1936; 1,004 people at age 70 (86 with diabetes)

- Childhood intelligence predicting diabetes and related traits
  - Glycated hemoglobin (HbA1C), body mass index (BMI)
- Polygenic risk scores for Type 2 diabetes
  - Based on Type 2 Diabetes GWAS consortium findings (Voight et al., 2010) [1]
  - Using all available SNPs, regardless of the 'significance' of the associations with Type 2 Diabetes
  - Using SNPs that had associations with T2D at various levels of significance ($p < 0.5, 0.4, 0.3, 0.2, 0.1, 0.05, 0.01$)

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Predictors of self-reported diabetes

- The eight risk scores, main effects: $OR = 1.61$ to 1.90 ($p < 0.001$)
- Age 11 IQ main effects: $OR = 0.72$ to 0.81 (mostly significant)

- Interactions: $p = 0.07$ to 0.26
  - Basically non-significant, that is
- Genetic risk groups (median-split on the all-SNP risk score)
  - Low genetic risk: the effect of age 11 IQ: $OR = 0.81$ ($p = 0.27$)
  - High genetic risk: the effect of age 11 IQ: $OR = 0.67$ ($p = 0.002$)

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- The eight risk scores, main effects: β = 0.17 to 0.20 ($p < 0.001$)
- Age 11 IQ main effects: β = -0.12 to -0.13 ($p < 0.001$)

- Interactions: p = 0.02 to 0.43
  - all ps < 0.05 except for the two least-SPN-inclusive risk scores
- Genetic risk groups
  - Low genetic risk: the effect of age 11 IQ: β = -0.11 ($p < 0.05$)
  - High genetic risk: the effect of age 11 IQ: β = -0.18 ($p < 0.001$)

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Support for genetic risk moderating intelligence-diabetes risk associations?

Possibly

- Results inconsistent in terms of significance but consistent in terms of pattern
- That is, such studies need large samples
  - Genetic risk prediction is wobbly
  - Psychological trait–somatic traits links are wiggly
  - wobbly * wiggly = a lot of wobble and wiggle

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Number of natural teeth in older age

A marker of health and life-long health care

- Low Emotional stability and Conscientiousness might predict poorer oral health
  - Only Conscientiousness did
- The associations might be moderated by SES
  - In 'good' environments (regular brushing, flossing and dental checks normative) people may just get carried along
  - In 'worse' environments stronger personal effort is needed to carry on regular day-to-day oral care
  - Personality traits (high conscientiousness) may give a relatively bigger advantage in worse environments

Mõttus, Starr, & Deary (in press; Health Psychol)

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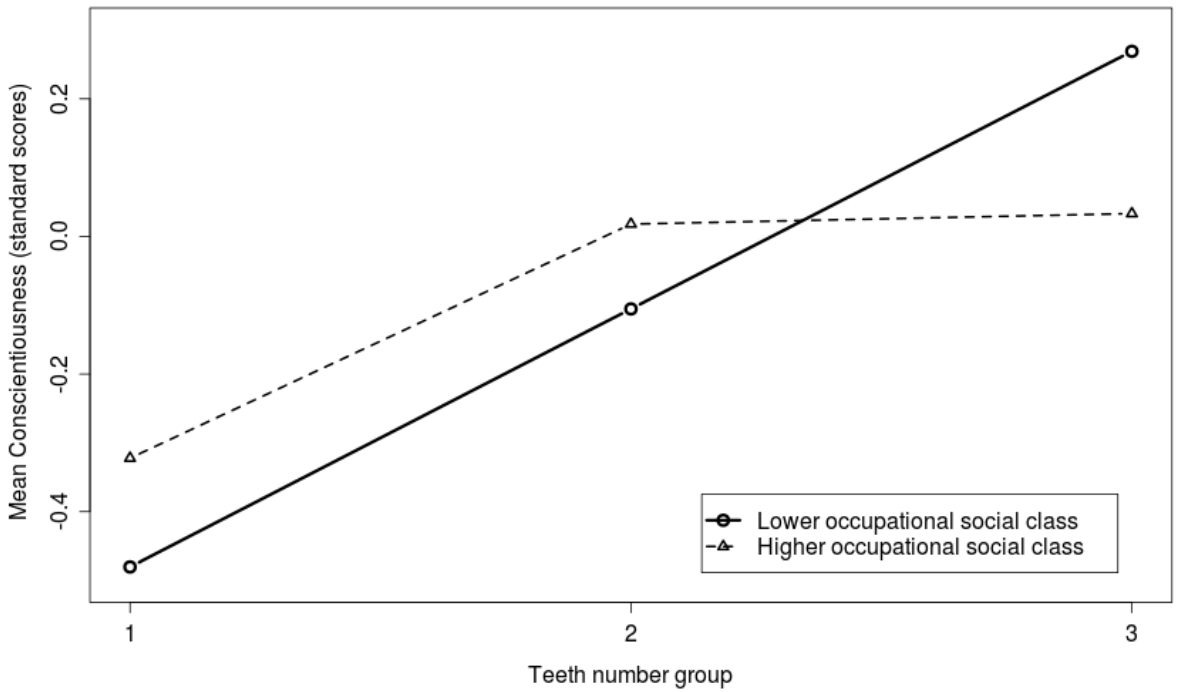
Mean Conscientiousness (standard scores)
0.2
0.0
-0.2
-0.4
1
2
3
Teeth number group
Lower occupational social class
Higher occupational social class

Psychological traits-somatic traits associations

- Maybe we can describe and understand them better if we set up and test more specific hypotheses
  - When the associations should be stronger/present or weaker/absent
- Parallel to the concept of convergent-discriminant validity
  - A meaningful pattern validates the whole idea

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Thank you

Michelle Luciano, Ian J. Deary, Mark McCarthy, John M. Starr

MAGIC and DIAGRAM consortia